

Remarks

Claims 1-11, 18-25, and 28-34 are pending in the subject application. By this Amendment, Applicants have canceled claim 11. Entry and consideration of the amendments presented herein is respectfully requested. Accordingly, claims 1-10, 18-25, and 28-34 are currently before the Examiner. Favorable consideration of the pending claims is respectfully requested.

Submitted herewith is a Request for Continued Examination (RCE) under 37 CFR §1.114 for the subject application. Also submitted herewith is a supplemental Information Disclosure Statement (IDS), accompanied by the form PTO/SB/08 and copies of the references listed therein.

Claims 30-34 are rejected under 35 USC §112, first paragraph, as lacking adequate written description. The Examiner asserts that there is no support in the subject specification for the claim language “the root of said dendrimer moiety.” Applicants respectfully assert that there is written description for the claim language. As an initial matter, Applicants note that the term “dendrimer” comes from the Greek word “dendron” which means “tree.” The molecular structure of a dendrimer resembles that of a tree: root, trunk, and crown (*i.e.*, the head of foliage of a tree). The subject specification, at paragraph 0018, notes the “tree-like branched architecture” of dendrons. In addition, as the Examiner acknowledges in the Office Action, the specification does reference the “root” of reagents used to prepare the dendrimer. It follows that the root of a dendrimer corresponds to the root of a dendritic reagent. Applicants also respectfully assert that the meaning of a “root of a dendrimer” is well understood in the art. It is understood, for example, that a dendrimer can have a root portion, a trunk portion, and a crown portion. Thus, even assuming that there is an absence of explicit support in the specification, which Applicants deny, there is implicit support for the claim language at issue. It is well settled in patent law that the language used in an amendment of a claim does not have to be disclosed word for word in a specification. *In re Wilder*, 222 USPQ 369, 372 (Fed. Cir. 1984) (“It is not necessary that the claimed subject matter be described identically, but the disclosure must convey to those skilled in the art that applicant had invented the subject matter later claimed.”); *In re Lukach*, 169 USPQ 795, 796 (CCPA 1971)(“... the invention claimed does not have to be described in *ipsis verbis* in order to satisfy the description requirement of §112.”). In addition, the Patent Office guidelines for examiners make it clear that explicit written support is not required to meet the requirements of 35 USC § 112, first paragraph. (“To comply with the written

description requirement of 35 U.S.C. §112, ¶ 1, ... each claim limitation must be expressly, implicitly, or inherently supported in the originally filed disclosure." (emphasis added) See "Guidelines for Examination of Patent Applications Under 35 U.S.C. §112, ¶ 1, 'Written Description' Requirement," *Federal Register* Vol. 66, No. 4, pp. 1099-1111, at page 1107, first column, lines 10-17). Thus, support for a claim limitation can be implicit or inherent in the disclosure of a patent application. There is implicit support for the claim language at issue throughout the subject specification.

In view of the above, Applicants respectfully assert that there is sufficient written description for the term "the root of said dendrimer moiety." Accordingly, reconsideration and withdrawal of the rejection under 35 USC §112, first paragraph, is respectfully requested.

Claims 30-34 are also rejected under 35 USC §112, second paragraph, as indefinite. The Examiner asserts that the metes and bounds of the term "root" are not clear. Applicants respectfully assert that the claims are clear and definite. The claims recite that a particular element (*e.g.*, the sol-gel substrate) is bonded to the root of the dendrimer structure. As discussed in regard to the rejection under 35 USC §112, first paragraph, the claim language pertaining to a root of a dendrimer is supported by the subject specification and is understood by a person of ordinary skill in the art. The claim language in question does not refer to "any anchor point of the dendrimer" as suggested by the Examiner. Thus, the claims simply require that some particular element is bonded to the root. There is nothing unclear or indefinite in the recited claim language. Accordingly, reconsideration and withdrawal of the rejection under 35 USC §112, second paragraph, is respectfully requested.

Claims 1-4, 8-10, 18-21, and 28-34 remain rejected under 35 USC §103(a) as obvious over Malik and Wang (WO 00/11463) in view of either Kim *et al.* (U.S. published application No. 2002/0020669) or Neumann *et al.* (German Patent No. DE 19,621,741). In addition, claims 6, 7, 24, 25, and 29-34 remain rejected under 35 USC §103(a) as obvious over Malik and Wang (WO 00/11463) in view of either Kim *et al.* (2002/0020669) or Neumann *et al.* (DE 19,621,741) and further in view of Newkome *et al.* (U.S. Patent No. 5,703,271). The Examiner asserts that it would have been obvious to modify the column disclosed in the Malik and Wang publication to include a dendrimer given that the Kim *et al.* publication teaches that dendrimers bonded on supports are economically feasible, versatile, and useable in chromatography and also because the Neumann *et al.*

patent teaches that the use of dendrimers increases the number of functional groups, thereby improving separation. The Examiner further asserts that it would have been obvious to use isocyanate in a column disclosed in the Malik and Wang publication in view of Kim *et al.* or Neumann *et al.* because the Newkome *et al.* patent teaches that isocyanate dendrimers have the flexibility of reacting with various chemical surfaces including siloxane and can be used in “column chromatography or the like for selective removal of agent from the material flowing through the column.” Applicants respectfully traverse these grounds of rejection.

Applicants respectfully assert that the references cited by the Examiner, whether taken alone or in combination, do not teach or suggest Applicants’ claimed invention. The present invention is not obvious over the cited references since conventional dendrimers lack a sol-gel-active root. If a person were to use a conventional dendrimer (*i.e.*, one without a sol-gel-active root in its structure) in the sol-gel system taught by Malik and Wang (WO 00/11463), the dendrimer will not chemically bond to the sol-gel matrix. A capillary column coated with such a sol-gel matrix will not be effective as a stationary phase or as an extraction medium since the dendrimer molecules will be washed off the capillary column during any rinsing with solvents.

As noted above, conventional dendrimers do not possess a sol-gel active root and none of the cited references teach how to prepare dendrimer with a sol-gel active root. Applicants note that the Neumann *et al.* patent first derivatizes the silanol groups on a silica surface with sol-gel-inactive groups (*e.g.*, amine) leaving essentially no accessible silanol groups to participate in the sol-gel reactions for covalent attachment of the sol-gel dendrimer coating to the silica surface. Therefore, if the teachings of the Malik and Wang publication is applied to the derivatized surface of the Neumann *et al.* patent, the created sol-gel coating will not be chemically bonded to the fused silica surface (few accessible silanol groups after derivatization) resulting in an unstable coating which will be easily washed off the substrate during treatment or operation. Clearly, a person of ordinary skill in the art having considered the cited references would not arrive at the sol-gel dendrimer capillary of the present invention where the sol-gel dendrimer coating is covalently bonded to the sol-gel substrate on the fused silica capillary surface.

The Kim *et al.* publication derivatizes the dendrimer’s exterior functional sites – not the root. If the dendrons of Kim *et al.* (with derivatized exterior functional sites) are used to prepare a sol-gel

dendron capillary column following the teachings of Malik and Wang, it will lead to one of the following two outcomes depending on whether the derivatized arm of the dendrimer is sol-gel-active or not:

(1) If the derivatized arm of the dendron is not sol-gel active, it will lead to a capillary column where the dendron is not chemically bonded to the sol-gel substrate of the created stationary phase coating, and therefore, this physically held dendron will be easily washed off or lost during capillary preparation, conditioning, or operation.

(2) If the derivatized arm of the dendron is sol-gel active, it will lead to a stationary phase where the dendron is attached to the sol-gel substrate by the crown (not by the root) since the derivatization is carried out on the exterior functional sites. Such architecture of the sol-gel dendron stationary phase is undesirable since it will drastically reduce the number of terminal functional groups on the dendron available for interaction with the analyte molecules. This is in direct contrast with the present invention where the dendron can be chemically attached to the sol-gel substrate by the root, thereby exposing all the terminal functional groups on the dendron for effective interaction with the analyte molecules. Thus, a person of ordinary skill in the art would not arrive at Applicants' claimed invention when considering the teaching of Malik and Wang in conjunction with the teaching of the Kim *et al.* publication.

Applicants respectfully assert that the Newkome *et al.* patent does not cure the deficiencies of the Malik and Wang publication, the Neumann *et al.* patent or the Kim *et al.* publication. The Newkome *et al.* patent does not teach or suggest how to chemically bind an isocyanate monomer-based dendron to a sol-gel substrate by the dendron root. Thus, the Newkome *et al.* patent suffers from the same failings as the Neumann *et al.* patent and the Kim *et al.* publication.

In addition, Applicants note that the methods described by Neumann *et al.* and Kim *et al.* for the preparation of dendrimer stationary phases are lengthy, requiring days and even months as opposed to a few hours required by the present invention. For example, on page 7 of the English translation of Neumann *et al.*, the author describes a method that requires 50 (fifty) days just to complete the chemical reactions for the preparation of a dendrimer stationary phase. Additional time will be required for washing, drying, packing, and conditioning of the stationary phase particles. By comparison, the present invention requires only a few of hours for the preparation of a capillary

column from start to finish (including *in situ* synthesis of the sol-gel dendrimer stationary phase, covalent binding of the stationary phase onto the inner walls of a fused silica capillary as well as washing, purging, and thermal conditioning of the coated stationary phase).

As the Examiner is aware, it is well established in patent law that in order to support a *prima facie* case of obviousness, a person of ordinary skill in the art must find both the suggestion of the claimed invention, and a reasonable expectation of success in making that invention, solely in light of the teachings of the prior art and from the general knowledge in the art. *In re Dow Chemical Co.*, 5 USPQ2d 1529, 1531 (Fed. Cir. 1988). One finds neither the suggestion, nor the reasonable expectation of success, of Applicants' claimed invention in the cited references. Accordingly, reconsideration and withdrawal of the rejections under 35 USC §103(a) is respectfully requested.

It should be understood that the amendments presented herein have been made solely to expedite prosecution of the subject application to completion and should not be construed as an indication of Applicants' agreement with or acquiescence in the Examiner's position.

In view of the foregoing remarks and amendments to the claims, Applicants believe that the currently pending claims are in condition for allowance, and such action is respectfully requested.

The Commissioner is hereby authorized to charge any fees under 37 CFR §§1.16 or 1.17 as required by this paper to Deposit Account No. 19-0065.

Applicants invite the Examiner to call the undersigned if clarification is needed on any of this response, or if the Examiner believes a telephonic interview would expedite the prosecution of the subject application to completion.

Respectfully submitted,



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Attachments: Request for Continued Examination
Petition and Fee for Extension of Time
Supplemental Information Disclosure Statement; Form PTO/SB/08; references